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Revision of *Astragalus* L. sect. *Hypoglottidei* DC in Iran

by

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Summary

Astragalus sect. *Hypoglottidei* in Iran including 8 species will be revised. Descriptions, distribution and a key to the species are presented. Three new species *A. perpexus*, *A. herbertii* and *A. pishchakensis* are described. One species from sect. *Tapinodes* and one from sect. *Malacothrix* are transferred to sect. *Hypoglottidei*.

Introduction

Since several years I am studying the genus *Astragalus* in Iran on the basis of the material of the two big herbaria in Tehran (TARI) and Evin, mainly collected in the years 1948 to 1987. In addition I have studied some species in the type locality for comparing with the descriptions of formerly described species. During this work the oligotypic section *Hypoglottidei* was revised.

Historical aspect

DE CANDOLLE (Prodromus, 1825) described his Sect. *Hypoglottidei* with *Astragalus hypoglottis* L. as the first species. Most of his 23 species of this section belong to the medifixed hairy subgenus *Cercidothrix* of the genus *Astragalus*. Nevertheless the section should be typified by *A. hypoglottis* L. In this case one could retain the name for this group of species named bei BUNGE (1868/69) illegitimately either sect. *Hypoglottis* or *Eu-hypoglottis*. The classification of BUNGE and unfortunately his illegitimate names are imitated not only by BOISSIER in his *Flora Orientalis* (1872) but also by nearly all recent taxonomists.

Taxonomic position of Sect. *Hypoglottidei* DC. within the genus *Astragalus*

The sect. *Hypoglottidei* is placed by BUNGE together with some others like *Malacothrix*, *Stereothrix*, *Dasyphyllium* and *Tapinodes* within his subgenus *Hypoglottis*. This is characterised by the presence of basifixed hairs, dense capitate or spicate flowers which are mostly purple, violet or ochroleuceous, by an unchanged campanulate to tubulous calyx and mostly bilocular fruits. Within the subgenus the sections are up to now not well circumscribed. Therefore it is not surprising, that one species, *A. rimarum*, described in sect. *Tapinodes* is now transferred in its right position within sect. *Hypoglottidei*.

Taxonomic characters

The most important characters, which are useful for delimitating the sections but also the species are the following:

Stipules position: Two forms of the stipules are recognized; stipules free; stipules jointed.

Leaflets: The shape, the numbers of the leaflets and their indumentum give the permanent characters.

Pilosity: The color and the form of the indumentum vary from one species to another. The color of the hairs on the calyx is variable, but the form of the hairs and their length give always the constant characters. Two different kinds of hairs are recognized: Spreading or patent hairs; appressed hairs.

Flower dissection: Standard: The shape, color, apical incision give the constant characters for separation of the closed taxa. Wing Petals: Shape of the limb, apical incision, basal auricles and the relationship of limb and claw give the botanical characters. Keel: Shape of the limb is a character of high taxonomical value.

Pods: The fruit show the different permanent characters. Related species show mostly a great similarity of the fruit. But other characters like morphology, the basal stipite, apical prolongation and the dorso-ventral aperture are very important to separate the related species.

Astragalus L. Sect. *Hypoglottidei* DC. Prodr. 2: 281. 1825

= Sect. *Hypoglottis* Bunge, Mem. Acad. Imp. Sci. St.-Petersbourg 11(16): 50. 1868 = Sect. *Eu-Hypoglottis* Bunge, l.c. 47. Lectotypus (hoc loco designatus): *A. hypoglottis* L.

= Sect. *Ciceroides* DC., Prodr. 2: 292. 1825. Lectotypus (hoc loco designatus): *A. cicer* L.

Perennial, acaulescent or caulescent. Stipules membranaceous, at the base adnate to the petiole and free or jointed to one another, covered with black and white hairs. Inflorescens a dense spike or capitate. Calyx cylindrical or more rarely campanulate, covered with white or mixed black hairs, the teeth setaceous. Corolla glabrous. Standard anguste oblong or rhomboid, deeply emarginate at apex. The limb of wing-petals emarginate tipped. Pods sessile, carinate ventrally, deeply sulcate dorsally, bilocular.

Key to species

- 1a. Stipules free from one another 2
- 1b. Stipules jointed to one another 3
- 2a. Plant stemless, bracts 3-4 mm. Calyx tubulous
..... *A. rimarum* Bornm.
- 2b. Plant with developed stem, bracts 1 mm. Calyx
campanulate *A. perpexus* Maassoumi
- 3a. Inflorescens capitate, spherical or rarely shortly
cylindrical. Calyx teeth setaceous longer than tube,
leaflets 12-15 pairs *A. brachpetalus* Trautv.
- 3b. Inflorescens a laxe or dense spike. Calyx teeth
subulate equaling or shorter than the tube, leaflets
5-10 pairs 4
- 4a. Leaves epetiolate, leaflets covered with patent
hairs *A. haematinus* Sirj. & Rech.f.
- 4b. Leaves with developed petiole, ca. 1,5-4 cm. Leaflets
covered with appressed hairs 5
- 5a. Calyx teeth 1/4 length of the tube
..... *A. herbertii* Maassoumi
- 5b. Calyx teeth equaling or minutly shorter than the
tube 6
- 6a. Standard ca. 11 mm, fruit without curvate beak
..... *A. atricapillus* Bornm.
- 6b. Standard 16-21 mm, fruit with distinct curvate
beak 7
- 7a. Wing-petals limb dilatated upwards, emarginate
tipped *A. nurensis* Boiss. & Buhse
- 7b. Wing-petals limb narrowly elliptic, deeply incised or
bicornous *A. pishchakensis* Maassoumi

Descriptions

- 1. *A. atricapillus* Bornm. Bull. Herb. Boiss. Sér. 2.5: 753
(1905).

Perennial, shortly caulescent, stem 7-10 cm tall. Stipules 2-2,5 mm long, triangular or acuminate, covered with short hairs, at the base shortly adnate to the petiole, and jointed to one another. Leaves 1-3 cm long, petiole 8-10 mm long, both petiole and rachis covered with long hairs. Leaflets 6-7 pairs, elliptic, obtuse, 2-3 mm long and 1-3 mm broad, upper surface in middle part glabrous, toward the

margin with scattered hair, lower surface covered with white appressed hairs. Inflorescens a dense spike or capitate, 1 cm in diameter, in young stage completely black, flowers 8-10 or more, peduncle 2,5-5 cm long in basal part with short white hairs, in part upper near the inflorescens mixed with black hairs. Bracts lanceolate 3 mm long, covered with long black and white hairs. Calyx campanulate or cylindrical, 8-9 mm long, covered with black and white hairs, the teeth setaceous 2-3 mm long. Corolla violet somewhat longer than the calyx. Standard 11 mm long, the limb rhomboid, emarginated at apex. Wing-petals 9 mm long, the limb narrowly elliptic, emarginate tipped. Keel 8 mm long. Pods oblong, stipitate, stipe ca. 1,5 mm long, carinate ventrally, sulcate dorsally, covered with white hairs, incomplete bilocular.

Specimens Seen:

Mazandaran: Kelardsht, Kuh-e Takhte-e Solyman, 3700 m, 12.7.1973, *Fotovat 10091*.

Semnan: Ca. 20 km W of Shahrud, above Nekarman, Kuh-e Shahvar (CF2) near the top, 3600-3900 m, 2.8.1982, *Assadi & Mozaffarian 40899*; *Ibidem*, 3700-3950 m, 1.8.1982, *40879*.

2. *A. brachypetalus* Trautv. in *Acta Horti Petrop.* 9: 447 (1884); *Fl. U.S.S.R.* 12: 19 (1946).

Perennial, caulescent, stem 30-35 cm tall, divided from the base. Stipules lanceolate, acuminate, 6-10 mm long, at the base shortly adnate to the petiole and jointed to one another. Leaves 5-7 cm long, petiole 1-2 cm, both petiole and rachis covered with white patent hairs. Leaflets 12-15 pairs, ovate or narrow elliptic, tip rounded or truncate, 7-10 mm long and 3-6 mm broad, covered with dense appressed hairs. Inflorescens capitate, ovoid or rarely cylindrical, 2-4 cm long, peduncle 5-8 cm long covered with black and with hairs. Bracts linear-lanceolate 6-9 mm long, covered with black and white hairs. Calyx campanulate 10-13 mm long, covered with black and white hairs, teeth of the calyx 6-8 mm long, setaceous, minutely longer than the tube. Corolla violet or purplish. Standard 10-12 mm long, the limb ovate or narrow elliptic, emarginate tipped or bilobe. Wing-petals 8-10 mm, limb emarginated at apex. Keel 6-7 mm. Ovary sessile, pilose. Pods ovoide 4-5 mm long, carinate ventrally, sulcate dorsally, covered with white hairs, bilocular.

Specimens seen

Gorgan: Golestan Forest, Almeh, 1750 m, 196.1974, *Wendelbo & Foroughi 12655*.

Khorasan: Shirvan, Namanlou, Golule, Cheshmeh-Ghabri 2400 m, 19.7.1986, *Termeh, Moussavi & Tehrani 41381 E*.

3. *A. haematinus* Sirj. & Rech. f., Anz. Öst. Akad. Wiss. Math. Nat. 90: 114 (1953).

Syn.: *A. viciaefolius* DC. var. *haematinus* (Sirj. & Rech. f.) Parsa, Fl. de l'Iran vol. 9: 25 (1966)

A. astarabadensis Sirj. & Rech. f., Anz. Öst. Akad. Wiss. Math. Nat. 90: 157 (1953).

Perennial, caulescent, stem devided from the base, 10-20 cm tall. Stipules acuminate or lanceolate, 2-3 mm long, covered with white patent hairs, at the base minutly adnate to the petiole and jointed to one another. Leaves 2-5 cm long, petiole very short, 2-5 mm long, both petiole and rachis covered with dense patent hairs. Leaflets 8-11 pairs, elliptic, rounded or truncate at apex, both surfaces covered with densly patent hairs, 3-4 mm long and 1-2 mm broad. Inflorescens a dense spike or capitate, 1-1,5 cm long, flowers numerous. Bracts herbaceous, elliptic, covered with patent hairs, ca. 4-6 mm long. Calyx cylindric ca. 11 mm long, the teeth subulat 1/2 as long as the tube, both tube and the teeth covered with white hairs or sometime mixed with black hairs. Standard 13-15 mm long, the limb rhomboid, attenuate toward apex, emarginate tipped or bilobe. Wing-petals 12 mm long, the limb narrow, emarginated at apex, at the base shortly auriculate, Keel 10 mm long. Ovary shortly stipitate, pilose. Pods unknown.

Specimens seen

Mazandaran: Siabisheh, S. slopes, 2200 m, 17.6.1984, Assadi & Mozaffarian 47620; 41 km to Sari on road from Damghan, 450 m, 17.5.1978, Wendelbo & Assadi 29574.

4. *Astragalus herbertii** Maassoumi sp. nov. Sect. *Hypoglottidei* DC.

Differt ab *A. rimarum* Bornm. stipulis inter se connatis (nec liberis), dentibus calycis tubo quadruplo brevioribus (nec aequantibus).

Perennis, acaulis, caespitosa, 3-6 cm alta. Caudex multi-ceps, rhizoma crassa lignosa. Stipulae ovatae, ca. 2 mm longae, glabrae vel sparse albo-nigro-hirsutae, basi breviter petiolo adnatae, inter se connatae. Folia 3-5 cm longa, petiolo 1,5-2 cm longo, sicut rachis laxe pilis sub-patentibus albo pilosis suffulto. Foliola 5-6 juga, remota, obovata, 2 mm longa et 1,5 mm lata, supra marginam versus laxe et subtus dense appresse pilosa. Inflorescentiae

* species named in the honour of Mr. Herbert VARNECKE, University of Regensburg, West Germany.

sessiles 3 flora. Pedicelli glabri vel subpatenter albonigro-hirsuti. Bractea 3-4 mm longae lanceolatae, albonigro-hirsutae. Calyx tubulosus 9-10 mm longus, dentibus triangularibus, tubo quadruplo brevioribus, tubo laxe et dentes versus dense nigro- vel albo-immixtis hirsuto. Corolla alba. Vexillum 16 mm longum, lamina anguste elliptica, apice emarginata. Alae 14 mm longae, lamina oblonga, apicem versus dilatata, antice breviter emarginata, basi auricula ca. 1 mm longa suffulta, ungue lamina paulo brevior. Carina 11 mm longa, lamina triangulari-curvata, apice rotundata, basi auriculata, ungue lamina paulo longiore. Ovarium pilosum, sessile. Legumen (immature) oblongum, patenter albo-nigro-pilosum, 8 mm longum et 4 mm latum, apice rostratum, curvatum, ventro carinatum, dorso sulcatum, biloculare.

Typus: Mazandaran, Veresk, Vazmilash, protected areae of Golzar mts. 1900-2750 m, 26.5.1980. Termeh, Danesh Pajuh, Zargani, 39851 (Holo: Evin).

5. *Astragalus nurensis* Boiss. et Buhse. Fl. Or. 2: 253 (1872)

Perennial, caulescent, or acaulescent, stem 5-17 cm tall. Stipules triangular, ca. 2 mm long, covered with black and white hairs, at the base shortly adnate to the petiole and jointed to on another. Leaves 6-7 cm long, petiole 2-5 cm long, both petiole and rachis covered with white appressed hairs. Leaflets 9-10 pairs, ovate or obovate, at apex truncate or emarginate, at the base cuneate, upper surface with scattered and the lower surface with dense appressed hairs. 4-10 mm long and 2-5 mm broad. Inflorescens a dense spike or sometimes capitate, flowers numerous. Bracts narrow-elliptic, 6-10 mm long, covered with long black and white hairs. Calyx cylindrical, with black and white hairs, 10-14 mm long, the teeth setaceous, 5-6 mm long. Corolla purplish or violet. Standard 18-20 mm long, the limb rhomboid or elliptic, emarginated at apex. Wing-petals 14-15 mm long the limb dilatated in upwards, shortly emarginated at apex. Keel 12 mm long. Ovary pilose, stipitate. Pods stipulate, stipe ca. 2 mm, covered densly with short white hairs, 10 mm long and 4 mm broad, with an arched-incurved beak, carinate ventrally, deeply sulcate dorsally, fully bilocular.

Specimens seen

Mazandaran: Ca. 50 km SW of Chalous, above the village Delier 280 m, 18.7.1984, Assadi & Maassoumi 51645; *Ibidem* 51549; *Ibidem*, 1500 m, 17.7.1984, Assadi & Maassoumi 51493; 4 km SW. of Javaherdeh, N. exposed slope 2500-2800 m, 29.6.1976, Runemark & Maassoumi 20872.

Semnan: Shahrud, Kuh-e Abr, Kuh-e Ghatri, 2500 m, 23.6.1974, *Wendelbo & Foroughi 12930*; ca. 50 km N of Semnan, mountains above Hikuh, 2400-2700 m, 29.7.1982, *Assadi & Mozaffarian 40656*.

Tehran: Karadje to Chalus, after tunelle, 2220 m, 8.6.1973, *Babakhanlou & Amin 15041*; ca. 7 km E. of Kandavan pass 2450 m, 24.6.1979, *Assadi & Mozaffarian 32921*.

6. *Astragalus perpexus* Maassoumi sp. nov. e Sect.
Hypoglottidei Dc.

Plantae perennis, 12-16 mm altae, caules nonnulli, basi brevissime appresse albo-pilosi vel apicem versus et in inflorescentiis niigris pilis patentibus immixtis. Stipulae minutae, ca. 2 mm longae, albo-nigro-hirsutae, basi breviter petiolo adnatae, inter se liberae. Folia 4-5 cm longa, petiolo ca. 1,5-3 cm longo. Foliola remota, 3-5 juga, oblongo-elliptica, vel rarius ovata, 9-11 mm longa et 2 mm lata, apice anguste rotundata, basi leviter cuneata, supra sparse et subtus dense appresse pilosa. Inflorescentiae in axillis foliorum, flores numerosi in capitum primo densiusculo deinde laxiuscule racemosum congestis. Pedicelli abbreviati, pilosi. Bracteae lineari lanceolatae, ca. 1 mm longae, albo-nigro-hirsutae. Calyx 6-7 mm longus, campanulatus vel infundibularis, albo-nigro-hirsutus, dentibus linearibus tubo aequantibus. Corolla violacea demum albida. Vexillum 11-13 mm longum, lamina anguste-elliptica, leviter rhomboida, apicem versus ligulata, antice profunde incisa vel manifeste biloba, basi in unguem brevem attenuata. Alae 8-9 mm longae, lamina anguste-elliptica, apicem versus attenuata, antice profunde biloba, lobae lineares, ca. 1,5-2 mm longae, basi auriculata, ungue lamina triplo brevior. Carina 7 mm longa, lamina oblongi-elliptica, dorso curvata, ungue lamina sesquilingiore. Ovarium pilosum, breviter stipitatum. Legumen ovoideum, dense pilosum, apice rostratum, basi stipite ca. 1 mm longo suffultum, 7-8 mm longum et 2-3 mm latum, ventre rotundatum, dorso sulcatum, biloculare, oligospermum semina 2-2,5 mm longa, 2 mm lata.

Typus: Chaharmahal-e Bakhtiari, Sabz Kuh, Chahar-Tagh, 2350 m, 16.5.1987, *Mozaffarian 59969* (Hol. TARI).

Other specimens seen

Esfahan, Boin, between Deh-e Pas Dom char and Masir, 2300 m, 23.5.1982, *Nouroozi & Rahiminejad 1602*.

Paratypus: Esfahan: Boin around Deh-e Masir, 2350 m, 22.5.1982, *Novroozi & Rahiminejad 1625*; Esfahan: Boin, between Deh-e pas Dom char and Masir, 2300 m, 23.5.1982, *Novroozi & Rahiminejad 1611*.

7. *Astragalus pish-chakensis* Maassoumi sp. nov.

Differt ab *A. nurensis* Boiss. & Buhse, statura elatiore, vexilli lamina apicem versus anguste appendiculata, antice profunde emarginata vel bicorna (nec anguste elliptica et brevissime emarginata). Alarum lamina apicem versus angustata (nec dilatata) emarginata. Semina brunnea (nec intense nigra).

Perennis caulescens, 35 cm alta. Stipulae 3-4 mm longae, glabrae vel subpatenter albo-nigro-hirsutae, basi breviter petiolo adnatae, inter se connatae. Folia 4-5 cm longa, petiolo 1-1,5 cm longo, sicut rachis patenter albo-nigro-piloso. Foliola 8-14 juga, dimorpha, inferiora minuta, obovata, superiora anguste obovata vel elliptica, apice truncata vel emarginata, basi cuneata, supra laxe, subtus dense patenter pilosa, 2-8 mm longa et 1-4 mm lata. Inflorescentiae axillares, pedunculo ca. 10 cm longo suffultae, patenter albo-nigro piloso. Bractea anguste ovatae, ca. 8-12 mm longae, albo-nigro-pilosae. Calyx tubulosus 12-14 mm longus, albo-nigro-pilosus, dentibus setaceus, 5-6 mm longus. Corolla violacea (in vivo), vexillum 17-18 mm longum, lamina apicem versus appendiculata, antice profunde emarginata vel biloba. Alae 15 mm longae, lamina anguste elliptica, antice emarginata, basi auricula ca. 1,5 mm longa suffulta, ungue lamina aequantes. Carina 12 mm longa, lamina elliptica, curvata, ungue lamina sesquilingiore. Ovarium pilosum, basi stipitatum. Legumen ellipticum, dense brevissime patenter albo pilosum, ca. 12 mm longum et 3-4 mm latum, apice rostratum, rostro curvatum, basi stipitatum, stipite ca. 3 mm longo, ventre carinatum, dorso profunde sulcatum, valvis lateralis compressis, biloculare. Semina (immatura), 1,5 mm longa, brunnea.

Typus: Mazandaran: Ca. 20 km S of Ramsar, between Tanoorekash and janat-Rudbar, (VA3), 14.7.1984, 3000-2000 m, Assadi & Maassoumi 514 (Hol. TARI).

Other specimens

Semnan: Shahrud, Kuh-e Ghatry, 2300 m, Foroughi & 955.

8. *Astragalus rimarum* Bornm. Bull. Herb. Boiss. Sér. 2, 5: 755 (1905)

Perennial, acaulescent, 3-5 cm tall. Stipules triangular, 1-1,5 mm long, covered with white hairs, rarely mixed with scattered black hairs, at the base adnate to petiole and free from one another. Leaves 4-5 cm long, petiole 2 cm long, both petiole and rachis covered with white appressed hairs. Leaflets 5-7 pairs, elliptic or obovat, 3-5 mm long and 2-3 mm broad, both surfaces covered with white appressed hairs. Inflorescens a spike, peduncle ca. 5 mm long,

covered with black and white appressed hairs. Bracts narrow-elliptic or lanceolate, acuminate. Calyx cylindric, 12-13 mm long, covered with black and white hairs, the teeth 3-4 mm long. Corolla white or violet with several parallele veins. Standard 12 mm long, the limb oblong-rhomboid, emarginated at apex or bilobe. Wing-petals 10 mm long, the limb oblong, dilatated toward the apex, emarginate tipped, the limb shortly longer than claw. Keel 7 mm long, the limb oblong, curved. Ovary pilose, stipitate.

Specimen seen:

Tehran: Karadj, Kandewan, Asadbar to Gerab, Assalak pass, 2900-3000 m, 9.6.1987. Maassoumi 59427.

Unknown species

A. curvidens Freyn et Bornm.

This species was described (FREYN et BORNM. 1905) from the Central region of Zagros mountains around Yazd. With the exception of *A. perpexus* Maassaoumi distributed in the same area, all the species of this section are localized on the Alburz ranges. The nearest relative of this interesting unknown species may be *A. perpexus* widely distributed in the same area. Several taxonomical characteristics of *A. curvidens* differ from *A. perpexus* and in some respect it differ from the section *Hypoglottidei* DC. *Hemiphaca*. Perhaps this curious species may belong to another section.

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